PIYUSH GARG

Postdoctoral Scientist
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Twitter, Professional Webpage, Datasets, Github, Argonne

WORK AND RESEARCH EXPERIENCE

- **Postdoctoral Scientist, Argonne National Laboratory**……Jan 2022 - Present
  Lemont, IL

  Apply Artificial Intelligence emulators to improve representation of cloud, convective and radiative processes in the Earth System Models with a special focus on using LSTM and CNN.

- **Postdoctoral Research Associate, University of Virginia**……Jul 2021 - Jan 2022
  Charlottesville, VA

  - Create a new cold pool – mesoscale convective system collocated database using satellite and ground-based observations in order to understand the effect of cold pools on different stages of thunderstorms.
  - Apply novel machine learning algorithms to improve representation of cold pool processes in large-scale climate models.

- **Doctoral Research Fellow, University of Illinois Urbana-Champaign** ……Jan 2016 – Jun 2021
  Urbana, IL

  - NASA Ocean Vector Winds Science Team (OVWST) funded my Ph.D. work to identify and characterize tropical oceanic mesoscale cold pools using satellite scatterometers, thus resulting in a first-ever tropical oceanic cold pool climatology.
  - Buoys and radar datasets were also used to analyze the *in situ* properties of tropical oceanic mesoscale cold pools.
  - High-resolution regional (WRF) and global cloud-resolution model (CRM) ICON simulations of cold pools were compared against satellite-observed cold pools.
  - Random forest regression was applied to ICON-simulated cold pool dataset to identify relationship between cold pools and their parent environment.

- **Junior Research Fellow, Indian Institute of Tropical Meteorology**……Aug 2015 – Dec 2015
  Pune, India

- Analyzed synoptic and mesoscale forcing mechanisms corresponding to orographic thunderstorms in the vicinity of *Western Ghats* Mountain ranges.

❖ **Trainee Meteorologist, Skymet Weather Services** ……..May 2015 – Jul 2015
Noida, India

- Relayed short-term forecast to a range of clients from agriculture to energy and actuarial science.

❖ **Research Assistant, Savitribai Phule Pune University** ……Jun 2014 – May 2015
Pune, India

- Used satellite- and ground-based radar and precipitation observations to understand controls on orographic thunderstorms over the *Western Ghats* Mountain ranges.
- Tuned the trigger function of Betts-Miller-Jänjïc (BMJ) cumulus parameterization scheme in WRF-ARW to improve the hindcast of heavy rainfall events over the west coast of Indian subcontinent.

EDUCATION

❖ **Ph.D. Atmospheric Sciences, University of Illinois** ……Jan 2016 – Jun 2021
Urbana-Champaign *Urbana, IL*

Thesis title: Tropical Oceanic Mesoscale Cold Pools in Observations and Models
Advisors: Prof. Stephen W. Nesbitt and Dr. Timothy J. Lang (NASA MSFC)

❖ **M.Sc. Atmospheric Sciences, Savitribai Phule Pune University and** …… 2013 – 2015
Indian Institute of Tropical Meteorology *Pune, India*

Thesis title: Simulation of Large-Scale Characteristics corresponding to Heavy Rainfall Events Over Indian subcontinent
Advisors: Dr. Medha S. Deshpande and Dr. P. Mukhopadhyaya

❖ **B.Sc. Physical Sciences, University of Delhi** ……2010 – 2013
Delhi, India

SKILLS

Python
C++
Fortran
Linux
Parallel HPC Computing
Cloud Computing
Machine Learning
Remote Sensing
Modeling
Field Research
Team Work
Independent Work
Communication

FIELD CAMPAIGNS

- **Clouds, Aerosols Monsoon Precipitation Philippines Experiment (CAMP²Ex)** ……Jul 2019 – Sep 2019 *Philippines*

  - Co-designed the scorecard for cold pool observation strategies during the campaign.
  - Worked on validating ground and airborne cold pool observations with satellite-retrieved cold pools.
  - Also acted as a forecaster during the Intensive Observational Periods (IOPs) during the campaign.

- **Remote Sensing of Electrification, Lightning, And Mesoscale/microscale Processes with Adaptive Ground Observations (RELAMPAGO)** ……Oct 2018 – Dec 2018 *Villa Carlos Paz, Argentina*

  - Deployed mobile mesonets, operated Doppler on Wheels (DOW) X-band radar and launched weather balloons to study severe thunderstorms in Argentina.

- **Great Plains Irrigation Experiment (GRAINEX)** ……..Jul 2018 – Aug 2018 *Lincoln, Nebraska*

  Operated Doppler on Wheels (DOW) X-band radar and launched weather balloons to study the land-atmosphere interactions in Nebraska.

HONORS AND AWARDS

- **Ogura Award for Outstanding Student Research** ……..May 2021 *Urbana, IL*

  Department of Atmospheric Sciences, University of Illinois Urbana-Champaign (UIUC) awarded the prestigious Ogura award honoring my research on creating a new algorithm to identify cold pools over tropical oceans.

- **NASA Group Achievement Award**……. Jul 2020

  Awarded with prestigious group achievement award by NASA for participating in the successful execution of CAMP²Ex Field campaign in summer 2019.

- **Indian Council of Scientific and Industrial Research (CSIR) Fellowship** …….2014 – 2016 *Pune, India*

  All India Rank (AIR) 70 (out of 5610 students) in a highly selective fellowship in atmospheric, oceanic, and planetary sciences awarded by the CSIR, Government of India.

❖ **Merit Gold Medal** ……Nov 2015
Pune, India

First rank (Gold medal) in M.Sc. Atmospheric Sciences awarded by the Savitribai Phule Pune University (Formerly University of Pune), India.

❖ **Best Student Oral Presentation** ……...Oct 2015
New Delhi, India

Awarded by World Meteorological Organization (WMO)/World Weather Research Program (WWRP) 3rd International Monsoon Heavy Rainfall Workshop.

GRANTS AND COLLABORATIONS

Grants Received:

Title:	Leveraging Multiple Observational Datasets to Advance Understanding and Simulation of Convection Lifecycles
Granting Agency:	NASA Earth Observing System Project Science Office
Dates of Award:	09/01/2021-08/31/2024
Award Amount:	$650,000
Role:	Collaborator (Lead PI: Gregory Elsaesser, NASA GISS and Prof. Kathleen Schiro, UVA).

Title:	High-Resolution WRF Simulations of Tropical Convection and associated Cold Pools in the Indian Ocean
Granting Agency:	NSF Extreme Science and Engineering Discovery Experiment (XSEDE)
Dates of Award:	07/01/2017-06/30/2019
Award Amount:	~500,000 Core Hours
Role:	Co-Principal Investigator (Other PIs: Deanna Hence, Stephen Nesbitt and Jeffrey Thayer, UIUC).

Title:	Using Satellite-Measured Ocean Vector Winds to Determine Cold Pool Characteristics and Their Relationship to Tropical Convective Variability
Granting Agency:	NASA Ocean Vector Winds Science Team (OVWST)
Dates of Award:	08/01/2018-07/31/2022
Award Amount:	$300,000
Role:	Collaborator (Lead PI: Dr. Timothy J. Lang (NASA MSFC), Prof. Stephen W. Nesbitt (UIUC).

LEADERSHIP AND MENTORSHIP

- **102nd AMS Annual Meeting** ……...01/23/22 – 01/27/22
  Virtual

  Session Co-Chair for "Advances in Understanding Tropical Mesoscale Convective Systems and Precipitation Processes using Observations, Models, and Artificial Intelligence".

- **Geoscience Education and Mentorship Support (GEMS)**……..2021 – 2022

  Mentoring undergraduate student in applying for a Ph.D. program in Geosciences.

- **Graduate Mentor** ……..2019-2021
  Urbana, IL

  Mentored undergraduate students on their research on tropical meteorology and remote sensing at the Department of Atmospheric Sciences, University of Illinois Urbana-Champaign.

- **Coding Instructor, Radar Meteorology** ……..Fall 2019
  Urbana, IL

  Taught Python programming to access National Weather Service (NWS) Radar data through Amazon Web Services (AWS) cloud computing to a class of undergraduate and graduate students as part of Prof. Robert Rauber's Radar Remote Sensing class.

- **Co-Chair, 2nd Midwest Student Conference on Atmospheric Research** ……...2017-2018
  Urbana, IL

  Co-chaired and organized 2nd Midwest Student Conference on Atmospheric Research (MSCAR), the annual conference of the Department of Atmospheric Sciences, University of Illinois Urbana-Champaign.

RECENT SUMMER SCHOOLS/TRAININGS/INTERNSHIPS

- **Effective High-Performance Computing for Climate and Weather** ……...08/24/20 – 08/28/20
  Virtual

- **Artificial Intelligence for Earth System Science Summer School and Hackathon** ……..06/22/20 – 06/26/20
  Virtual

- **3rd International Summer School on Data Science and Environment** ……..07/03/17 – 07/08/17 *IMT Atlantique, Brest-Bretagne, France*

- **Advanced Training on Earth Observations for Weather and Climate** …….09/05/16 – 09/09/16 *NERC, Reading, UK*

RECENT CONFERENCE PROCEEDINGS

- **102nd AMS Annual Meeting: 19th Conference on Mesoscale Processes** ……..01/23/22 - 01/27/22 *Virtual*

  Garg, P., Nesbitt, S.W., Lang, T.J., Priftis, G., 2022: Tropical Oceanic Cold Pools in a High-Resolution Cloud-Resolving Model.

  Garg, P., Schiro, K.A., Russell, J., Kulkarni, S.R., Elsaesser, G., 2022: Evaluating Characteristics of Tropical Oceanic Mesoscale Cold Pools and their Collocated Parent Convective Systems.

- **Tropical Pacific Observing Needs to Advance Process Understanding and Representation in Models Workshop (US CLIVAR)** ……..05/24/21 - 05/26/21 *Virtual*

  Garg, P., Nesbitt, S.W., Lang, T.J., Priftis, G., 2021: Diurnal Cycle of Tropical Oceanic Mesoscale Cold Pools in Observations and High-Resolution Model.

- **AMS Tropical Conference** …….05/10/21 - 05/14/21 *Virtual*

  Garg, P., Nesbitt, S.W., Lang, T.J., Chronis, T., Thayer, J.D., Hence, D.A., 2021: Identification and Characterization of Tropical Atmospheric Cold Pools using Space-borne Scatterometer, Precipitation, Modeling.

- **European Geophysical Union Annual Meeting** ……...04/19/21 - 04/30/21 *Virtual*

  Garg, P., Nesbitt, S.W., Lang, T.J., Priftis, G., 2021: Tropical Oceanic Mesoscale Cold Pools in High-Resolution Global Icosahedral Nonhydrostatic (ICON) Model from DYAMOND.

PUBLICATIONS

Garg, P., Schiro, K.A., Russell, J., Evaluating Tropical Oceanic Mesoscale Cold Pool Properties Collocated with their Parent Convective Systems. In preparation to be submitted to *JGR-Atmospheres*.

Garg, P., Nesbitt, S. W., Lang, T. J., Priftis, G., Chronis, T., Tropical Oceanic Mesoscale Cold Pools in High-Resolution Global Cloud Resolving Model. *Submitted to JAMES.*

van den Heever, S.C., Amiot, C., Crosbie, E., Digangi, J.P., Falk, N., Freeman, S., **Garg, P.,** Grant, L., Hristove-Veleva, S., Lang, T.J., Maring, H., Miller, S., Nesbitt, S.W., Posselt, D., Reid, J., Sokolowsky, G.A., Van Diedenhoven, B., Wang, J., Woods, S., Ziemba, L., The Cold Pools of CAMP²EX. *In Preparation.*

Priftis, G.; Lang, T.J.; **Garg, P.;** Nesbitt, S.W.; Lindsley, R.D.; Chronis, T. Evaluating the Detection of Mesoscale Outflow Boundaries Using Scatterometer Winds at Different Spatial Resolutions. Remote Sens. 2021, 13, 1334. https://doi.org/10.3390/rs13071334

Garg, P., Nesbitt, S. W., Lang, T. J., & Priftis, G. (2021). Diurnal Cycle of Tropical Oceanic Mesoscale Cold Pools, Journal of Climate (published online ahead of print 2021). Retrieved Aug 31, 2021, from https://journals.ametsoc.org/view/journals/clim/aop/JCLI-D-20-0909.1/JCLI-D-20-0909.1.xml

Garg, P., Nesbitt, S. W., Lang, T. J., Priftis, G., Chronis, T., Thayer, J. D., & Hence, D. A. (2020). Identifying and characterizing tropical oceanic mesoscale cold pools using spaceborne scatterometer winds. Journal of Geophysical Research: Atmospheres, 125, e2019JD031812. https://doi.org/10.1029/2019JD031812

Flynn, W. J., Nesbitt, S. W., Anders, A. M. and **Garg, P**. (2017), Mesoscale precipitation characteristics near the Western Ghats during the Indian Summer Monsoon as simulated by a high-resolution regional model. Q.J.R. Meteorol. Soc., 143: 3070–3084. doi:10.1002/qj.3163

Garg, P., Deshpande, M.S., Bhawar, R.P., 2015, Understanding Large Scale Characteristics corresponding to Heavy Rainfall events over India. Vayu Mandal (41), Bull. of India Met. Soc. 62-68.

SERVICE

Peer Reviewer

- AMS' Journal of Climate (JCLI)
- RMETS Meteorological Applications
- AMS' Journal of Applied Meteorology and Climatology (JAMC)
- AGU's Journal of Geophysical Research – Atmospheres (JGR-Atmospheres)
- AGU's Geophysical Research Letters (GRL)
- Royal Meteorological Society's International Journal of Climatology
- Nature Scientific Reports